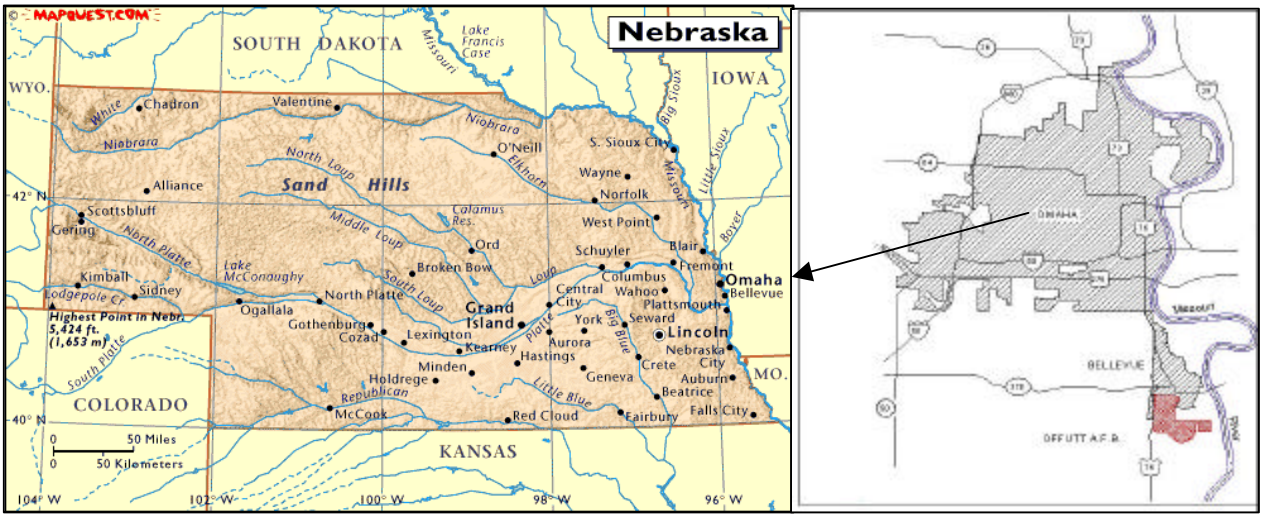
SECRETARY OF DEFENSE
ENVIRONMENTAL SECURITY AWARD
FOR
ENVIRONMENTAL
RESTORATION
INSTALLATION
2000

OFFUTT
AIR FORCE BASE
NEBRASKA

INTRODUCTION:

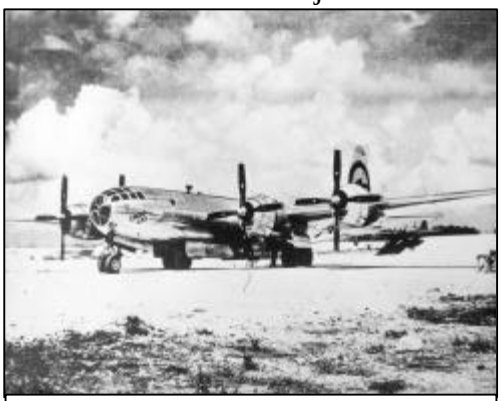
Offutt Air Force Base, Nebraska, is located in eastern Nebraska, south of the cities of Omaha and Bellevue. The main base currently covers approximately 4,063 acres, including Capehart housing, two navigational annexes, and administered geographical separated units (communication sites). The base is located in the southern area of the Omaha/Council Bluffs, Iowa, metropolitan statistical area and is bordered by the City of Bellevue on the north, by residential areas on the west, and by and primarily used for agricultural land to the south and east. The manned Elkhorn Communications Facility, located 4 miles north of Elkhorn, Nebraska, in western Douglas County is a detachment of Offutt AFB.



Offutt AFB Location Map and Surrounding Communities/Map of Nebraska.

HISTORY OF OFFUTT AFB:

From 1894 to 1948, the base was a military installation known as Ft. Crook Army Post. The fort's namesake was Major General George Crook, a renowned Indian fighter and Civil War hero who commanded the forces that Apache War Chief Geronimo surrendered to in 1886. The 61st Balloon Company became the first air unit to command the post in September 1918. In the spring of 1921, the plowing, leveling, and seeding of 260 acres of land at Fort Crook created an airfield suitable for frequent takeoffs and landings and a refueling point for military and government aircraft on cross country flights. In 1924, it was named Offutt Field, in memory of Omaha's first air casualty in World War I, Lt. Jarvis J. Offutt. In May of 1942, the Nebraska Bomber Assembly Plant, better known as the Glenn L. Martin Bomber plant, began making the first of many B-26 Marauders and B-29 Superfortresses. By the end of World War II, a total of 531 B-29 Superfortresses and 1,585 B-26 Mauruders were built in the Martin Bomber Building. The "Enola Gay" and the not as well known "Bock's Car", the planes that dropped the atomic bombs on Hiroshima and Nagasaki, Japan, were built at the Martin Bomber plant. In 1948, Fort Crook and Offutt Field were



"Enola Gay"

renamed Offutt Air Force Base and were transferred to the Department of the Air Force. In November 1948, Offutt gained international prominence when it became the host base for Headquarters Strategic Air Command. The base was chosen to maintain a command post under the headquarters building that could withstand all but a direct hit from a nuclear attack. This base could, upon order from the President, order the launch of manned bombers with nuclear weapons from bases around the country, and/or nuclear missiles stored in submarines at sea or silos scattered throughout the mid-west in retaliation for any attack made on the United States.

Martin Bomber Plant.

Operations at Offutt AFB included the basing of alert bombers and tankers in the 1950s and 1960s, supporting intercontinental ballistic missile sites in eastern Nebraska and western Iowa and conducting worldwide strategic reconnaissance from the mid-1960s to the present. The Strategic Air Command (SAC) maintained command and control of the Air Force nuclear forces through redundant systems including the underground command post and EC-135C, Looking Glass aircraft. Today, U.S. Strategic Command performs that mission for all nuclear weapons utilizing the underground and mobile command posts and the TACAMO aircraft. The arrival of the National Emergency Airborne Command Post mission in 1977 further enhanced Offutt's strategic importance during the 1970s and 1980s. The base is currently

Historic Parade Grounds at Offutt AFB.

National Airborne Operations Center, E-4B, at Offutt.

Entrance to Offutt AFB (Avenue of Flags).

assigned to Headquarters Air Combat Command (ACC), Langley AFB, Virginia. Many of the original buildings constructed on the post before 1900, including the guardhouse and various enlisted and officers' quarters, are still in use today. Thirty-six facilities and the parade grounds are on the National Register of Historic places.

Offutt's fleet of RC-135, OC-135, and WC-135 aircraft are in constant demand around the world to provide global situational awareness to military leaders and government officials. Additionally, Offutt's E-4B aircraft provide transport and command and control for the President, the Secretary of Defense, and Secretary of State.

The military population of Offutt AFB is approximately 7,950 and civilian population is approximately 2,800. The populations of the surrounding cities of Omaha and Bellevue are 374,000 and 50,000, respectively. Offutt's host unit is the 55th Wing, the largest wing within the Air Force's Air Combat Command. Additionally, the base is home to many significant associate units, such as the U.S. Strategic Command Headquarters, the Air Force Weather Agency, Omaha operating location of the Defense Finance and Accounting Service, and others.

BACKGROUND:

The Restoration Element is assigned to the 55th Civil Engineering Environmental Management Flight and is comprised of three individuals: the Remedial Program Manager (RPM), a program manager, and an environmental protection assistant.

The Environmental Restoration Program (ERP) at Offutt AFB began in 1985 with the Phase I report. The Environmental Protection Agency (EPA), Region VII, Kansas City, Kansas, reviewed the site conditions at Offutt and determined that the base should not be on the National Priorities List but that regulatory authority could be maintained through the Hazardous and Solid Waste Amendments (HSWA) of 1984 portion of Offut's Resource Conservation and Recovery Act (RCRA), Part B permit issued 15 June 1987. EPA Region VII maintains authority through Part II of the permit; most recently reissued 23 October 1998. The permit addresses the investigation requirements for existing Solid Waste Management Units (SWMUs) and the identification and reporting requirements for new SWMUs, as well as issues relating to non-compliance. The RCRA permit recognizes that the investigations of SWMUs will be conducted under the general provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as part of the ERP but retains RCRA oversight authority. This unique arrangement assures a single investigation of a site will satisfy both CERCLA and RCRA requirements. Regulatory review is provided by the Nebraska Department of Environmental Quality (NDEQ) and the EPA Region VII. There are 26 ERP sites associated with Offutt AFB. Seventeen sites are closed or require no further action, one site is awaiting EPA approval for closure, two sites are under long-term monitoring, and six are under remediation. These sites include storage tanks, landfills, drainage areas, fire training areas, spill areas, and a low-level radioactive waste site. Primary contaminants in soil and water include fuels, waste solvents, medical radioactive waste, and general refuse.

PROGRAM SUMMARY:

Ultimately the goal of the Environmental Restoration Program is to protect human health and the environment from contamination generated from past practices of handling and disposal of

hazardous materials. Due to the nature and extent of the contamination, cleanup of contaminated sites is generally a slow and expensive process. Also due to these factors it is difficult, in many cases, to clean up a site using a single remedial action. Our goal at Offutt AFB it is to incorporate interim remedial actions wherever feasible to clean up the contaminated sites as rapidly and inexpensively as possible while meeting regulatory requirements and keeping the local community in mind. Offutt used its partnerships with the Air Force Center for Environmental Excellence (AFCEE), Brooks AFB, Texas, and the EPA to implement interim remedial actions at little cost to ACC or the Air Force. Innovative technologies demonstrated at Offutt acted as interim remedial actions and provided additional site characterization at 5 ERP sites over the past two years at a cost savings to the ERA program of over $2 million (M). Partnering with outside agencies to demonstrate new technologies reduced clean-up times at some sites by more than a decade.

Equipment to Dig Trench.

Installation of Biowall.

ACCOMPLISHMENTS:

INNOVATIVE TECHNOLOGIES:

Offutt was the test site for many innovative technology demonstrations, resulting in several full-scale operations assisting with the remediation of ERP sites. These innovative technology demonstrations saved over $2 M in environmental restoration costs and helped to obtain further knowledge about the most effective and efficient ways of cleaning up the ERP sites.

Biowall

Offutt's Building 301 ERP site was selected for a field test of one of the latest innovative treatment technologies. This technology uses a natural organic matter treatment trench and surface amendments for the *in situ* bioremediation of chlorinated hydrocarbon impacted media.

Trench Measures 23 Ft Deep, 100 Feet Long, 1 Foot Wide.

Filling Trench With Organic Material (Wood Chips and Coarse Sand).

The presence of Trichloroethene (TCE) and degradation products, (e.g., cis, 1-2-Dichloroethene [DCE]) and the shallow depth to groundwater facilitating installation of the trench drove the selection of Offutt's Building 301 site.

In January 1999, the treatment trench was installed near the base boundary at the Building 301 ERP site. The treatment trench was filled with material comprised of 50 percent mulch produced at the base and 50 percent coarse sand. The trench is 100-feet long, 1-foot wide, and 23-feet deep and was designed to intercept the groundwater plume. Organic material placed in the trench is expected to ferment, producing hydrogen which will cause a chemical reaction known as reductive dechlorination as the contaminants pass through the trench-treatment wall. Similarly, a natural organic matter amendment was applied in a test plot to the ground above a portion of the plume. This treatment method relies on infiltration to transport soluble organic matter into the subsurface, where the organic matter ferments, producing hydrogen required for reductive dechlorination. First rounds of samples indicate very favorable results. Results were so favorable the experiment will be expanded and installation of a full-scale wall is planned for early 2001.

Laser Induced Fluorescence Chemical Sensor Technology:

Recently, Dakota Technologies, utilized Offutt's ERP sites to demonstrate the use of a Laser Induced Fluorescence (LIF) chemical sensors to determine the exact location of subsurface contamination using direct push soil probes. This unique technology provides continuous vertical profiles of subsurface chemical contamination.

The system sends UV light through fiber optic cable strung within rods. The light exits through a window in the side of the probe. As the probe is advanced, the soil is exposed to the UV light. If fluorescent compounds exist (i.e., contaminants), light is emitted. The signal light is

Laser Induced Fluorescence Equipment.

transmitted through a fiber backup hole to be analyzed. Responses are indicated in real-time on a graph of signal vs. depth. The graph can also display false color logs and waveforms to aid in identification of the contaminant present.

Petroleum Product Removal System:

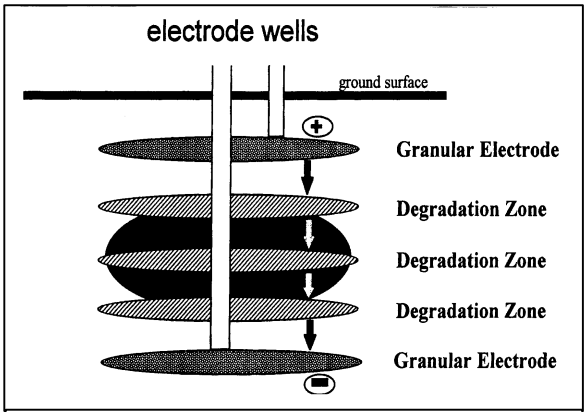
An explosion-proof free-product recovery system operated by liquid nitrogen was installed at Offutt's Tank 349 ERP site to recover gasoline floating on the water table. This is a zero water recovery system, which significantly reduces the volume of waste to dispose. The recovery system consists of a control system, recovery system, and transfer system. A timer provides intermittent pumping control for the skimmers by controlling the amount of nitrogen supplied to the skimmer pumps. Nitrogen is supplied for a selected time period and a selected number of cycles per day. The recovery system consists of two recovery wells, conveyance tubing from each well to the control area and skimmer pumps. Free-phase product removed from each well is transferred to a 55-gallon drum through individual, buried polyethylene tubing. Recovered free-phase product will be periodically transferred from the 55-gallon drums to a transfer vehicle using a hand pump. This free-phase product recovery system is designed to operate automatically with minimal need for adjustment or manual interface. During the system's 3 months of operation, approximately 200 gallons, roughly 1/3, of the free product was removed, thereby saving over $300,000 in long-term treatment costs and significantly accelerating remediation.

Tank 349.

Installation of Product Recovery System at Tank 349.

Lasagna™ In Situ Soil Remediation Technology:

The EPA in agreement with DuPont, GE, and Monsanto Company has developed an in-situ soil treatment technology dubbed the "Lasagna" process. Offutt AFB environmental restoration personnel, in turn, partnered with the EPA to demonstrate this technology. The technique involves the use electro-osmosis. This involves using electrical current to draw contaminated groundwater through treatment zones of iron filings. This technology is particularly effective in treating contamination found in tight soils. The Lasagna technology is now in full-scale operation at ERP site LF-12.



Horizontal Cells of Lasagna Project.

Application of a voltage gradient across a section of saturated soil causes movement of fluid and associated contamination the cathode (electron source). Since electro-osmosis is relatively insensitive to soil particle size, it will occur just as effectively in low permeability clay soils as in

high permeability sandy soils. As a result, electro-osmotic purging is many times more efficient than a pump and treat system for clay soils.

Geoprobe at site LF-12.

Sampling at site LF-12.

The Lasagna™ process involves the creation of treatment zones in the soil using hydrofracturing, directional drilling, and sheet piling. The treatment zones are placed in the soil between the electrodes in order to "intercept" contaminants as they flow through the pore spaces due to the applied electric field. At site LF-12, iron filings are being used as a treatment media.

Offutt AFB partnered with the EPA Center Hill Research Facility for a full-scale demonstration at the site LF-12. The Air Force funded exploratory work at Offutt AFB and arranged for installation of utilities and an instrument building. EPA personnel worked at the site for 2 years testing electrode designs and delineating the soil source before installing the full-scale system.

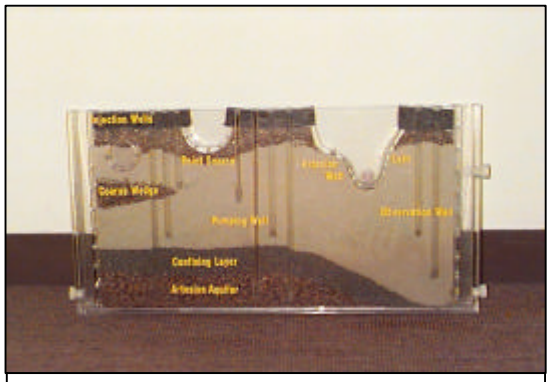
Two Lasagna™ cells, each about 30 feet in diameter, have been installed in the soil source. The electrodes for these cells contain 1,500 pounds of graphite each and are located at 20 and 25 feet below the surface. Between the electrodes are 2 treatment zones containing 1,200 pounds of granular iron each. Control (no treatment) areas were established on both sides of the Lasagna™ cells. The two Lasagna™ cells and the two control areas were sampled before treatment and will be sampled again after treatment to measure the effectiveness of the process and the extent to which natural attenuation affects contaminant levels.

PARTNERING WITH OUTSIDE AGENCIES AND RESTORATION ADVISORY BOARDS:

Offutt developed and continues to maintain an excellent rapport with members of the EPA Region VII, the Nebraska Department of Environmental Quality (NDEQ), Cities of Bellevue and Omaha, and members of the local community, all working toward the same cleanup goals for these sites.

Offutt AFB developed a Restoration Advisory Board (RAB) to include public involvement in the ongoing ERP activities on the base. The RAB is comprised of the EPA, NDEQ, City of Bellevue, installation representatives, and 14 members of the local community. From its beginning and through the award period, the RAB members have been very supportive of the ERP to clean-up sites and protect human health and the environment. The RAB is pleased that Offutt plans to have all remediations in place by FY 2005, 2 years ahead of Air Force goal of FY 2007.

Offutt AFB was the first Air Force base selected for membership in the Groundwater Guardian Program and has remained an active member in the program for the past 4 years. The Groundwater Guardian Program was established by the Groundwater Foundation, Lincoln, Nebraska. It is an international, non-profit educational organization developed to inform and motivate people to care about and protect their groundwater. Offutt's activities in the program include groundwater wellhead protection, increased recycling programs, pollution prevention, underground storage



Groundwater Model.

Demonstration at Local School.

tank replacement, and activities to educate and inform the public about how they can protect their groundwater. During Earth Day 2000 activities, Offutt environmental personnel visited local elementary schools, giving presentations to over 1,500 students. These presentations focused on pollution prevention, recycling, and endangered species. A groundwater flow model is used to demonstrate to students how contamination flows in the subsurface and the impact it can have on the environment and their drinking water.

SMALL AND SMALL DISADVANTAGED BUSINESSES

Past practices at Offutt AFB under the Environmental Restoration Program have included providing opportunities to small and disadvantaged businesses. One such example is a landfill cap at site LF-13. The project was awarded to a small and disadvantaged business in 1993, and

Installation of Cap at site LF-13.

Site LF-13 After Cap.

was successfully completed. Numerous opportunities continue to arise for small business, both as subcontractors to Offutt's primary contractor URS, and as the prime contractor. Between 25 and 35 percent of the program was awarded to small and disadvantaged businesses through the prime contractor for remediation efforts. The work is substantial and meaningful and has included such activities as analytical laboratory, surveying, drilling and direct push support.

Elkhorn Production Well Abandonment Project:

The Elkhorn Communications Facility is located four miles north of Elkhorn, Nebraska, in western Douglas County. The facility was constructed in 1951 and began operation in 1952. Site use prior to that time was agricultural. Facility operations have adhered to its original mission: to provide communication support for the U.S. Air Force.

Offutt AFB won the 1999 Engineering Excellence Award from the American Consulting Engineers Council of Nebraska for the Elkhorn Communications Facility production well abandonment project. Abandonment of the production well prevented Trichloroethene contamination from migrating down the gravel pack of the production well 350 feet into the Dakota Sandstone aquifer.

Trichloroethene was used at the facility as a cleaning compound and solvent until 1990. Remedial Investigation at the site indicated a shallow groundwater plume was located in the unconsolidated loess overburden at the depth of approximately 32 feet. This shallow organic layer could be tracked downgradient to where it intersected with the top of the gravel pack of the production well. The gravel pack provided the pathway to the potable Dakota Aquifer, approximately 320 feet below ground surface. Due to the gravel pack acting as a conduit or pathway for contamination from the shallow groundwater to the deeper Dakota Aquifer, a method of adequately sealing the casing and the gravel pack was designed and contracted, eliminating the pathway for contamination to reach the deeper aquifer. Sampling results for the new facility supply well and the nearby private wells have not detected Trichloroethene indicating complete success.

Groundwater Monitoring Well Abandonment:

Over the past 2 years, Offutt successfully negotiated with regulators for approval to abandon over 50 groundwater monitoring wells, saving thousands of dollars in maintenance costs. The wells were installed for Remedial Investigations at many of the ERP sites; however, they were no longer needed. Abandonment of the wells eliminates a potential pathway for contamination to reach the aquifer.

Offutt AFB continues to be a good steward of the community by taking a proactive approach in involving the public in its restoration projects. Offutt also continues to be a leader in environmental restoration, using many innovative technologies for remediation of sites and reaching ERP site closeout. By utilizing these innovative technologies and many outside resources, Offutt saved over $2 million in environmental restoration costs.